regarding the problem raised by this investigation it would seem most appropriate to consider it in the light of any other scientific problem and to apply to its solution the scientific method. There should be no place for prejudice or for inertia. A rigid determination of the facts is called for, as a basis for conclusions. Such generalities as "the course should give a broad introduction to the subject" or "the course should give a look in on the subject" or "the course should cover the ground" do not contribute much to a reasonable practise. Only a clear analysis of the conditions inherent in the subject, of its interdependence upon other subjects in the curriculum, of the character of students to be taught, and of the instructor's part can lead to conclusions of value.

There are, accordingly, certain fundamentals which seem to demand attention. The first of those is the purpose for which the course is given. Is it primarily concerned in presenting the content, aims, methods or applications of the subject? Or is it possible in one course to include all these equally? Again, what form of presentation is the course to have—is absorption, verification or discovery on the part of the student to be emphasized? In considering the character of the course it would seem necessary also to have in mind the reason for its inclusion in the college curriculum as one of a series of more or less required subjects. Does it find a place here because of a certain informational value which recommends it to every liberally educated man, or is there something peculiar or distinctive about its methods or viewpoint which is absent, or less well represented, in other types of subjects?

It is true that no subject stands alone and that it is therefore impossible to make a complete and satisfactory determination of a course without taking into consideration, not only its interrelations within the curriculum, but also the varied material circumstances of the institution in which it is given. These considerations should not however prevent the fullest analysis of the problem or delay unduly the execution of such steps as are practicable for the improvement of the work. The influence of a thoroughly scientific practise in one department of a college can not fail to manifest itself to some degree in others and might lead to a much needed survey of the whole problem of college instruction. From the statements so far received it is apparent that there is lacking among biologists any general agreement upon the nature of the elementary biological courses and upon the reasons for their inclusion in the preparation of the liberally educated man. Such a situation would seem to be hardly commendable for any subject, and especially not for biology which deals with materials and processes in which purpose is so evident. It is possibly due to this lack of definite purpose and practise that biological subjects do not occupy the place in the curriculum which the best interests of the college students would require.

If there can be a full expression of opinion on these questions, after careful consideration, it may be possible to arrive at some general conclusion that should guide the operation of elementary biological courses. In this event it would then be possible to decide upon practical details with much less trouble, and with more profit. It is hoped that there will be such a general interest in this subject that a consensus of opinion upon at least the major elements of theory and practise may be reached. In order partly to guide such a consideration there will be published a number of typical outlines of courses already received upon which criticisms are invited. These suggestions and any other discussions upon the subject of zoological courses may be addressed to

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WALLACE CLEMENT WARE SABINE[1]

OUR colleague, Wallace Clement Ware Sabine, was born in Richwood, Ohio, June 13,

[1] Minute on the life and services of Professor Sabine placed upon the records of the Faculty of Arts and Sciences at the meeting of March 18, 1919.

1868. Four racial strains were joined in him, for each of his four names represents some family of his ancestors, one Scotch, one Dutch, one English, one French. The Sabines, of Huguenot stock, came to Ohio from New England in the early part of the nineteenth century. The Wares, his mother's family, of English Quaker antecedents, came there about the same time, probably from New Jersey. Of his father's father, John Fletcher Sabine, the son of a circuit preacher, we are told:

> He was of such gentle disposition that in manhood he renounced the stern faith of his father and came to believe that "all men would be saved." . . . He died at the age of eighty-nine, with mind as vigorous and clear as in youth, with a remarkably retentive memory. His wife was Euphemia Clement, a gentle, industrious, reliable woman. Hylas Sabine was their oldest son.

Of his mother's father, Jacob Reed Ware, it is written:

> He was one of the early, ardent abolitionists and lived on the most direct line from Southern slavery to freedom in Canada. . . . Untiring of body, alert of mind, and exceedingly strong of purpose he lived in perfect health, with such simple habits that at the age of ninety-eight, without disease, he fell asleep. J. R. Ware married Almira Wallace, a woman of force and uprightness. Anna Ware was their first daughter.

To those who knew Sabine well this brief family history is deeply significant. Gentleness, courtesy, rectitude, untiring energy, fixity of purpose that was like the polarity of a magnet, all these traits we found in him. It is interesting and impressive to see how the individualism and stern conscience that made his ancestors on the one side Protestants in France and on the other side Quakers in England found expression in him, under changed intellectual conditions. He was of the very stuff of which martyrs are made; in fact, he died a martyr to his sense of duty, but, with an austerity of morals and a capacity for devotion which none of his conspicuously religious forefathers could have surpassed, he held aloof, silently but absolutely, from all public profession of religious creed, and he took small part in religious observances.

As a child he was allowed to develop without forcing, but such was the natural vigor of his mind that he gained the degree of A.B. at Ohio State University at the age of eighteen. He is said not to have specialized in his college studies, but he had in Professor T. C. Mendenhall an inspiring teacher of physics, and his early interest in scientific matters is shown by the fact that he attended a meeting of the American Association for the Advancement of Science held in Philadelphia in 1884, when he was sixteen years old. On leaving Ohio State University in 1886 he came to Harvard as a graduate student in mathematics and physics, and he received the Harvard A.M. in 1888. From 1887 to 1889 he held a Morgan Fellowship, but in the latter year he became an assistant in physics. Rather early in his Harvard residence he was taken by Professor Trowbridge as partner in a photographic study of the oscillating electric discharge, and he showed a remarkable aptitude for work of this kind, requiring high experimental skill, yet he never became a candidate for the Ph.D. Absorption in the work of teaching prevented him for several years from engaging deeply in further work of research. He spent his energy and his talents in building up courses of laboratory work, designing and making apparatus for instruction and in every way practising with devotion the profession of a teacher. It is not too much to say that, for the fifteen years preceding his taking the duties of a deanship, he was the most effective member of the department of physics in giving inspiration and guidance to individual students of promise. This was due in part to his comparative youth, though none of the department were repellently old; in part to his sympathetic willingness to give help and to spend much time in giving help, though others were not lacking in this quality. It was perhaps due mainly to the fact that, while he was no more deeply versed than others in the profundities of physics and mathematics, he had a peculiarly clear vision for the right kind of experimental problem and for the best way of attacking it, and his students instinctively, it may be, perceived this.

For a long time he seemed to be content to remain in comparative obscurity, while directing others into paths of conspicuous achievement. He was made assistant professor of physics in 1895, after six years of teaching, in which he had published little or nothing descriptive of research. This was partly because he had a most severe standard for what a research paper should be: it should describe some piece of work so well done that no one would ever have to investigate this particular matter again. To this standard he held true, with the result that his published papers were remarkably few and remarkably significant.

One might have expected him, when he found time for research, to take up some problem in light, for that seemed to be his chief field of interest; but accident, and a sense of duty, turned him to a different quarter. The Fogg Art Museum, on its completion in 1897, proved to have an auditorium that was monumental in its acoustic badness, and President Eliot, who had formed a high opinion of Sabine's qualities, called upon him to find a remedy, as a practical service to the university. With this warrant for diverting some of his energy from teaching, Sabine entered upon an investigation which proved to be his most conspicuous scientific work. Though he was dealing with a new structure, he was attacking a practical problem as old as the institution of public buildings. It had never been solved before in any thorough-going manner. He did solve it, and he did this not by virtue of any extraordinary resources given by modern science. He did it in such a way as to show that it might have been done by a man like him centuries before. Not only did he cure the defect of the particular room that first engaged his attention; he went on with his study till he could tell in advance what the acoustic qualities of a projected auditorium would be; and his visible instruments in all this achievement were organ pipes, common fabrics and materials, and the unaided human ear.

Was it, then so easy and simple a thing to do? Did he merely happen to find the solution of a difficulty thousands of years old? No. He succeeded by reason of a combination of qualities, among which were unending patience and untiring energy. He must work in the small hours of the night, when other men had ceased from their noisy labors and when street-cars were infrequent; he must, for certain ends, work only in the summer, when windows could be kept open; in the early summer, before the crickets began their nightly din. He must work with the most scrupulous regard for conditions that to another might seem trivial. He once threw away the observations of months because he had failed to record the clothes he wore while at his work. Such was the difficulty of his undertaking, on the mere physical side, and such the rigor of his devotion to it. We say of such a man, It is a pity he died so young. If he had taken care of himself, had been regular in his meals and in his hours of sleep, he would have had a long as well as a useful life. Yes; but the things he undertook to do, and did do, can not be done by a man who must be regular at his meals and regular in his hours of sleep.

The establishment of a Graduate School of Applied Science, in place of the undergraduate Lawrence Scientific School which had existed at Harvard for a long time, was the result of a movement led by Sabine in 1906. It was doubtless his hope, from the start of his connection with this revolutionary action, to make the Harvard School of Applied Science one of the highest and best in the world; but concerning the wisdom of making it distinctively and only a graduate school, he was not altogether positive, in spite of the fact that the suggestion to make it such is attributed to him. In fact, the decision of the faculty to approve this policy was arrived at in a curiously casual way. Argument against it was made at a faculty meeting, and nobody seemed to be confidently in favor of it. Sabine told a colleague the next day that just before the vote was taken he tried to get the president's attention, to move a postponement of the question. He did not succeed, the vote was taken, and the policy was launched.

Sabine took the deanship of the Scientific School reluctantly, at the urgent request of

President Eliot, but he threw himself into the duties of the office with characteristic energy, devotion, and elevation of ideals. It was his ambition to make the school as good as any school of applied science anywhere, and he strove for that end.

Whether the history and fate of the school would have been notably different if it had included undergraduate programs of study, is, fortunately, a question we need not discuss. For it is now possible to undertake the experiment of building up at Harvard a school of applied science second to none in its higher reaches but standing on a base of directed undergraduate work done within Harvard walls. In this undertaking we can have no better ideals than those which Sabine's deanship kept always before us.

When this deanship ended, he returned gladly to the work of teaching and research, and but for the war he would probably have had before him a long career of growing usefulness and fame, and would have lived to a vigorous old age according to the habit of his ancestors. But from that fiery furnace into which other men were drawn by millions he could not hold himself back. He would have felt recreant if he had escaped unscathed. Going to France in 1916 with the intention of giving a course of lectures as exchange professor at the Sorbonne in the fall, he engaged during the summer in the work of conducting tuberculous patients from the French hospitals to Switzerland, an enterprise undertaken by the Rockefeller Foundation. Overworking in this, he was attacked during the fall by a disease which nearly ended his life and compelled the postponement of his Sorbonne lectures. When he was able to be moved, he went back to Switzerland, this time as a patient; but he gained strength studying French constantly meanwhile, and in the spring of 1917 gave his lectures, on achitectural acoustics, in Paris. These ended, he went through some months of extreme activity in the technical science service of the allied governments. Returning to America in the late fall, he went on with similar work in Washington, and elsewhere, coming to Cambridge for his lectures every week, eating and sleeping when and where he could, always too busy for the surgical operation which his physical condition demanded. He refused military rank, declaring, with that severity of judgment which sometimes verged upon intolerance, that the uniform should be worn only by those who were subject to the dangers and labors of the front. But he risked his life constantly, and at last fatally, in the service of the country and the university.

We have known in him a rare spirit, and we reverence his memory.

EDWIN H. HALL,
C. N. GREENOUGH,
P. W. BRIDGEMAN,
Committee

SCIENTIFIC EVENTS

THE GASPÉ BIRD RESERVES

THE Parliament of the Province of Quebec, in its present session, has passed a law creating, on very broad lines, the remaining lodges of water-fowl on the shores and the islands of the Gulf of St. Lawrence into one great Bird Reserve to be under the administrative control of the Minister of Fisheries. Three definite areas are embraced within this protective provision, all of which are within the county of Gaspé.

1. Percé Rock, the picturesque and brilliant Devonian Island which lies a few rods off the coast of Percé village. Its bird colony is constituted of the Herring Gull and the Crested Cormorant.

2. The east and north cliffs of Bonaventure Island which lies three miles out from Percé. Here is probably the largest surviving colony of the Gannet with its customary associates—the Kittiwake, Razor-billed Auk, Puffin, Guillemot and Murre. The law takes over the entire face of the high cliffs where the two colonies on this Island are located and also a belt of land ten feet back from the edge of the cliffs.

3. The celebrated but now somewhat depleted colony of the Bird Rock, northernmost of the Magdalen Islands, 124 miles out to sea from Percé, in the heart of the Gulf.